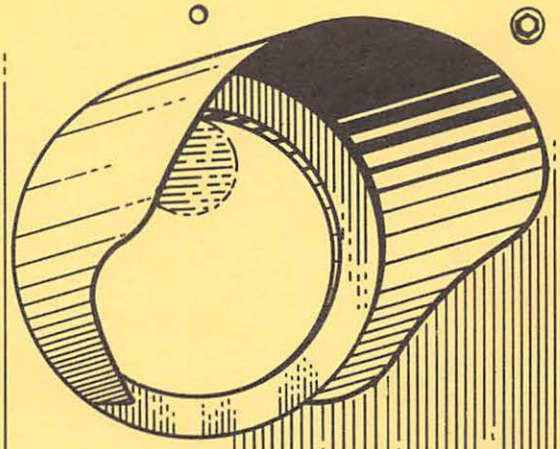
C. A. Bell

Style "H-5"

Searchlight Signal



U. D. 237

Union Switch & Signal Co.

Swissvale, Pa.

Form 2127

Union Switch & Signal Co.

SWISSVALE, PA.

Subject	STYLE H-5 SEARCHLIGHT SIGNAL	Union Development	
		Number	237
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			15 Sheets

Modern signaling with its complex circuits, all relay interlockings, and other developments to meet the demands of high speed transportation, has created a need for an improved searchlight signal which is easily installed and maintained, and which has a quickly detachable operating unit providing for rugged construction, durability and reliable performance. The Union Style H-5 Searchlight Signal has been developed in answer to this requirement.

The Style H-5 Searchlight Signal incorporates all the basic principles and the major advantages of popular searchlight signals, yet it is a radical departure from the types familiar for the past fifteen years. The more apparent advantages are:

1. Operating unit is quickly detachable and plug-connected.
2. Reflector and lamp bulb are independent of the operating unit, and are also quickly detachable on the plug-in principle.
3. The reflector assembly and both lenses of the doublet combination are mounted in the signal case independent of the operating unit and in fixed relation to each other.
4. The contact capacity of the operating unit is 2F-2B independent for both the yellow and green position. All back contacts are closed at the red position.
5. Absolute interchangeability of operating unit without affecting lenses, reflector, or wiring.

6. Absolute interchangeability of reflector assemblies without affecting operating unit or lenses.
7. External wiring permanently attached to fixed terminals independent of operating unit.
8. The plug connector feature permits a complete removal and replacement of operating unit in 30 seconds.

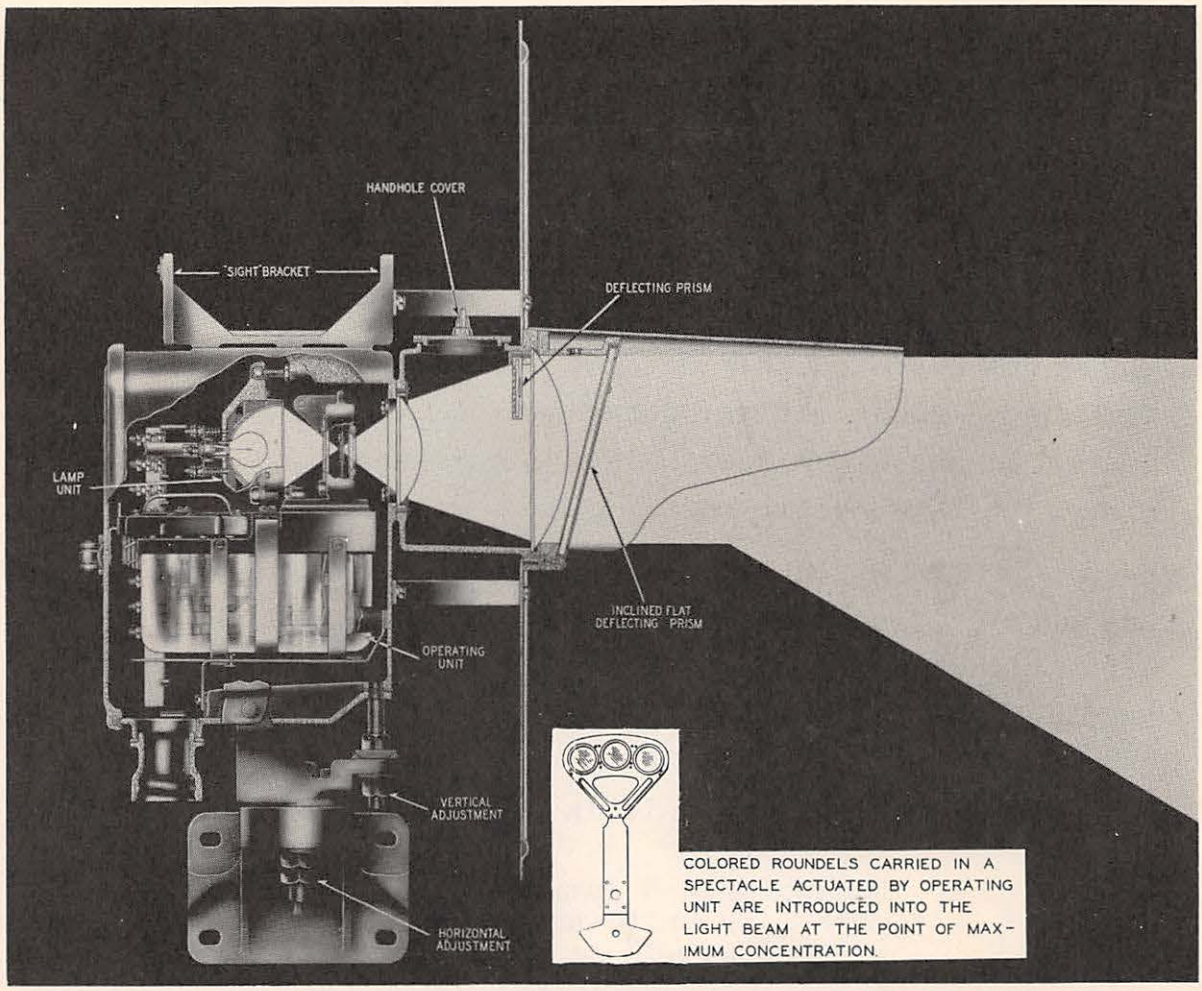

HANDHOLE COVER
SIGHT BRACKET
DEFLECTING PRISM
LAMP UNIT
INCLINED FLAT DEFLECTING PRISM
OPERATING UNIT
VERTICAL ADJUSTMENT
HORIZONTAL ADJUSTMENT
COLORED ROUNDELS CARRIED IN A SPECTACLE ACTUATED BY OPERATING UNIT ARE INTRODUCED INTO THE LIGHT BEAM AT THE POINT OF MAXIMUM CONCENTRATION.

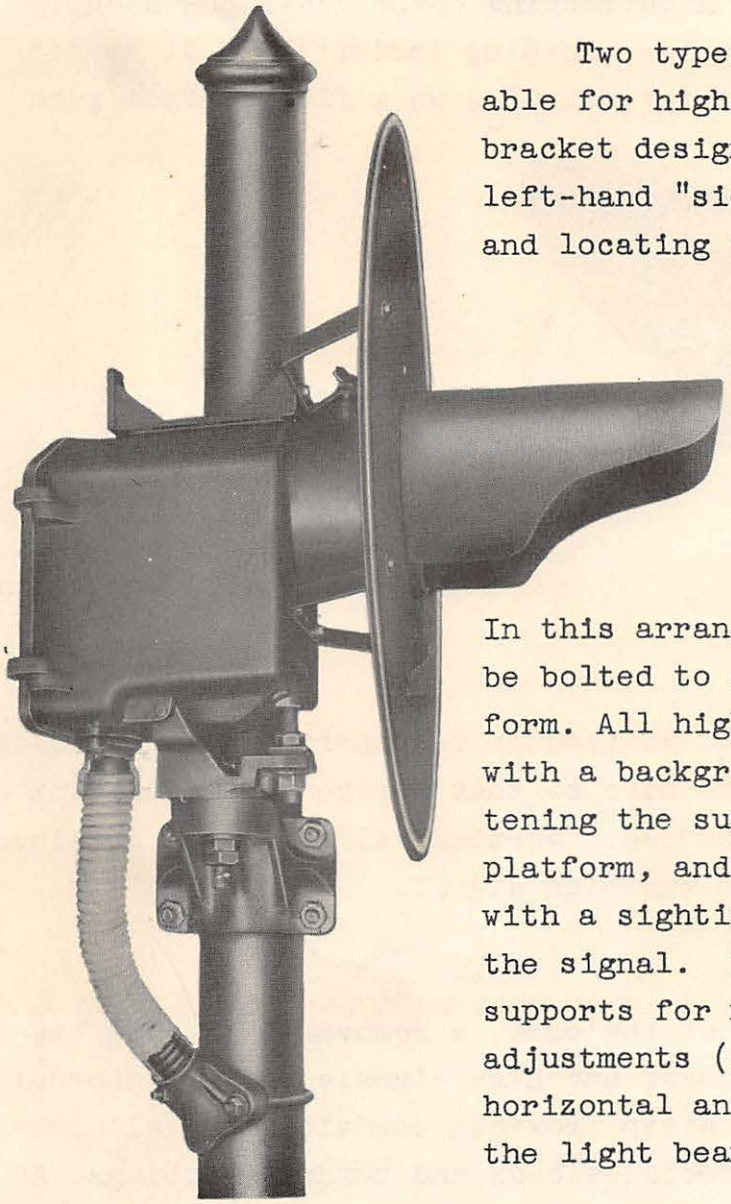
Fig. 1 - Style H-5 Searchlight Signal showing section view of optical combination, including the reflector and lamp unit assembly. The inclined flat deflecting prism is used only where a wide horizontal spread of beam is necessary.

CONSTRUCTION

The Style H-5 Color Light Signal, Fig. 1, consists of an outer case, an operating unit, and a background. The

outer case includes the doublet lens combination, reflector and lamp assembly, terminal boards for external wires, plug connectors, lens hood, and adjusting base support. The operating unit includes the contacts, the movable spectacle with colored roundels, and the plugs for plug connections.

High Signals



Two types of supports are available for high signals. One type is a bracket designed for either right or left-hand "side of mast" mounting, and locating the center line of the signal approximately ten inches from the center line of the mast as shown in Fig.2. Another type provides for bridge or platform mounting. In this arrangement, the signal may be bolted to a flat plate or platform. All high signals are furnished with a background and bolts for fastening the support on a mast or to a platform, and each signal is equipped with a sighting device for aligning the signal. Provision is made in the supports for making easy and accurate adjustments (separately) in both the horizontal and vertical alignments of the light beam.

Fig. 2 - Side view of Style H-5 Searchlight Signal, showing means for obtaining horizontal and vertical adjustments. The conduit and upper fitting are sectioned to show improved threaded type fittings for flexible conduit.

Dwarf Signal:

The Dwarf Signal, Fig. 3, is the same as the high signal except without background or sighting device, and is equipped with a special deflecting cover glass. The usual close-up prism is located at the bottom of the outer lens to provide an upward indication with minimum interference from the hood. In addition, a deflecting cover glass has been added to further improve the close-up indication. It is fitted with a base suitable for mounting on a flat surface such

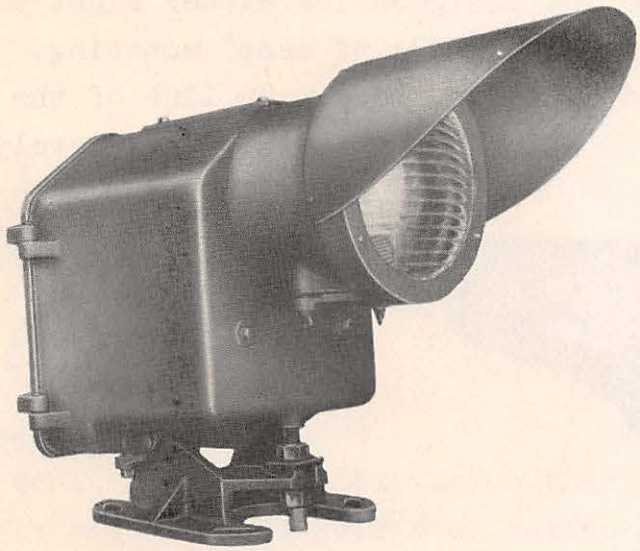


Fig. 3 - Style H-5 Dwarf Signal

as a concrete foundation, instead of a support bracket. Slotted holes are provided in the base so that horizontal adjustment of the light beam may be secured. Vertical alignment is obtained in the same manner as in the high signal.

Conduit Fittings:

On the bottom of the case, a removable fitting has been provided for both dwarf and high signals having internal threads to match single strip flexible conduit, thus eliminating the necessity of special elbows and conduit fittings. A pole fitting has been provided with external threads which, when screwed into the lower end of the flexible conduit and fastened to the pole with a "U" bolt, eliminates the necessity of tapping threads into the pole opening (See Fig. 2).

Operating Unit:

The Style "H-5" Searchlight Signal operating unit, Fig. 4, follows the same fundamental principles that have been so successful in previous types, but improved with regard to safety factor and efficiency.

The permanent magnet field has a fewer number of magnets, and at the same time provides a resultant field that is stronger than heretofore. The vertical armature air gaps have been retained, but with more liberal dimensions.

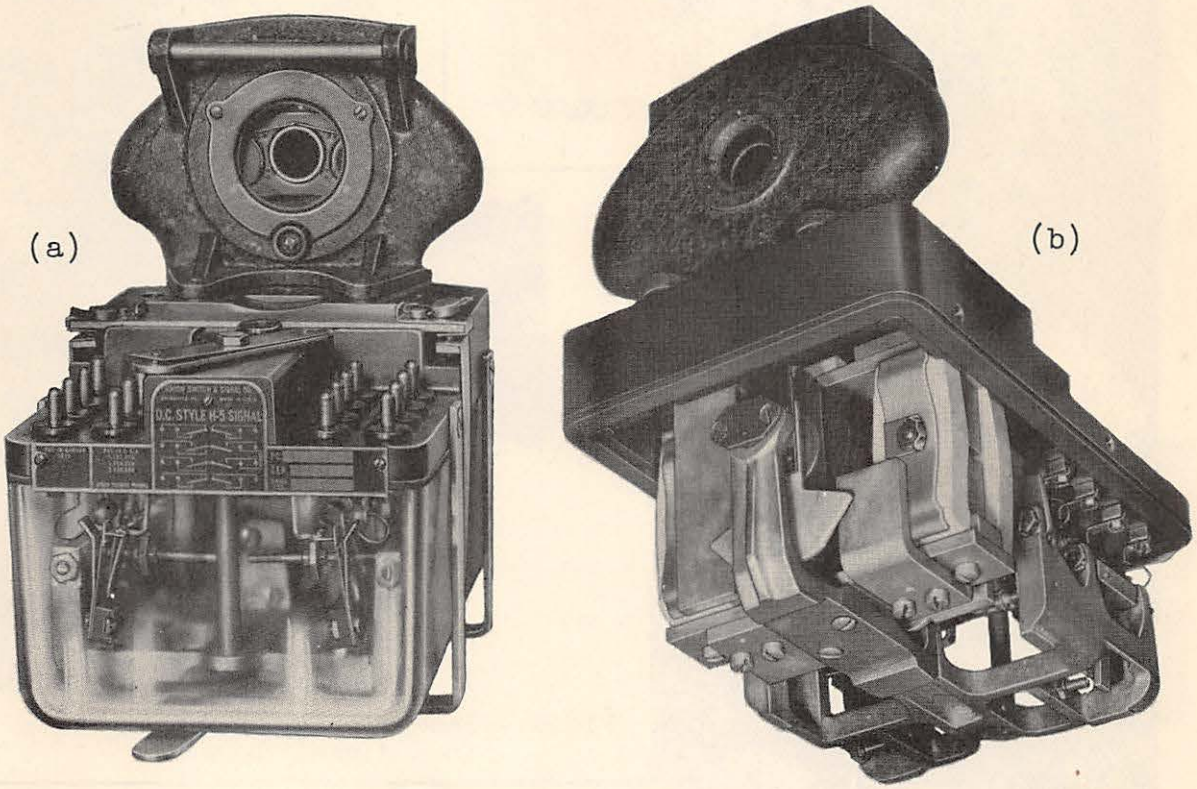


Fig. 4 - Operating Unit: (a) Front view showing plugs for plug-in connectors and bar for locking connectors in place; (b) rear view, with glass cover removed.

The rotating pole shoes are suspended vertically downward from the armature instead of horizontally to the right and left. This simplifies the counterbalancing weight structure on the spectacle support.

Previous signals have been limited to 1F-1B dependent contact on each side (yellow and green positions). The

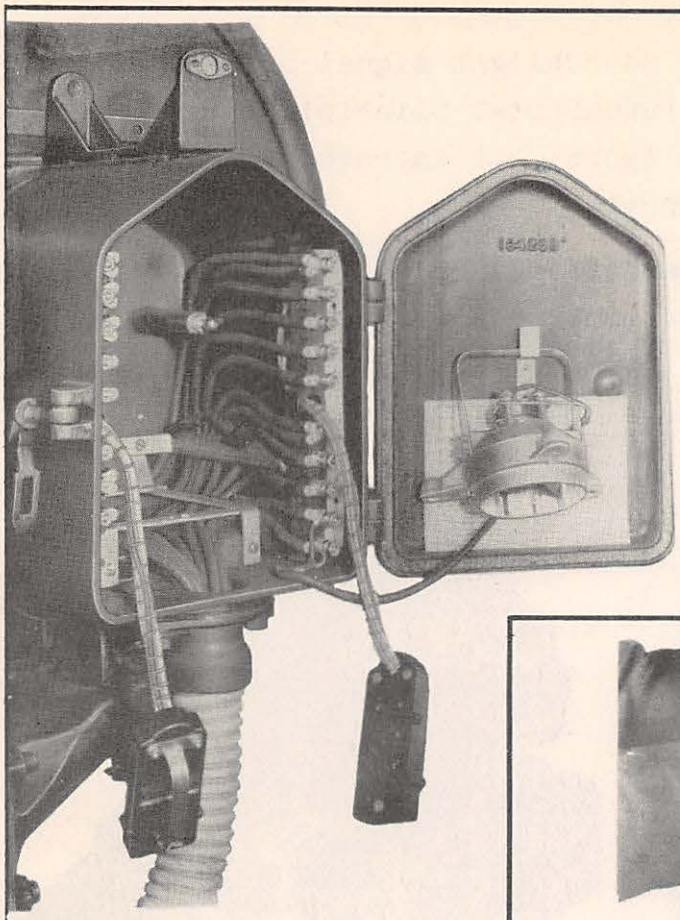


Fig. 5 - Signal Case with Operating Unit and Reflector Assembly removed, showing wiring and rack support for Operating Unit.

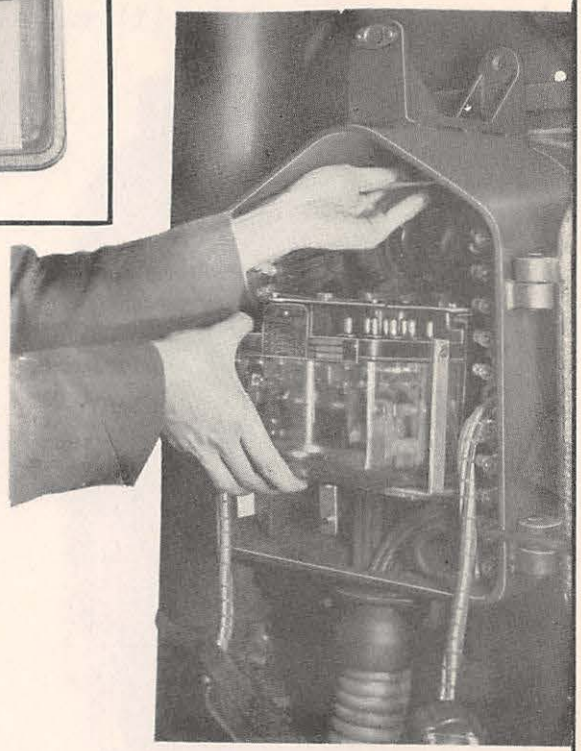


Fig.6 - Inserting an Operating Unit in a Signal Case

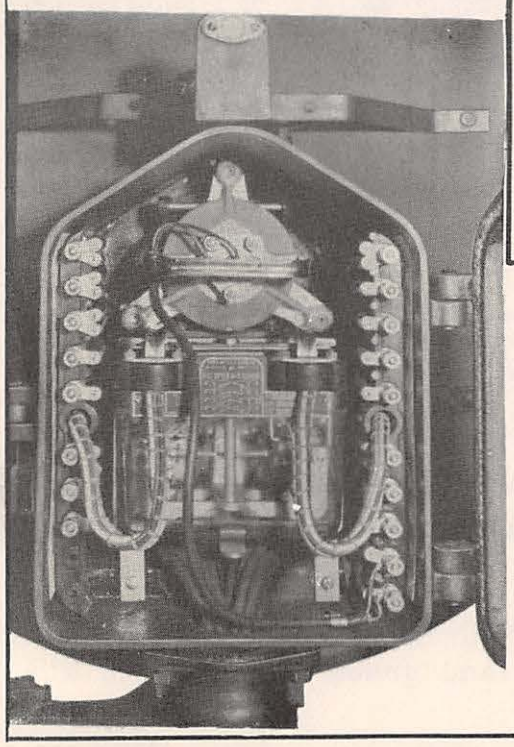


Fig. 7 - Style H-5 Signal. All parts assembled in case and wired.

H-5 Signal is equipped with 2F-2B independent contacts on each side. All four back contacts are closed when the operating unit is deenergized. The entire working parts of the operating unit are enclosed and sealed.

A glass case provides for ample visual inspection. This glass case is made without openings, and is clamped against a special rubber gasket in the top plate by means of a strap support.

The greatest possible care is taken in the selection of materials used, and in the manufacture and inspection of this instrument to insure its being equally as reliable in operation as any tractive type D.C. relay.

Assembly of Operating Unit in Signal Case: (See Figs.5,6 & 7)

The operating unit is accurately located and fastened in the signal case by means of a suspension frame bolted to the top plate. Two runners on this frame slide between two rails on a track fastened into the signal case, until they encounter a stop. An arm which moves in a horizontal plane is fastened to the frame, and when moved to the center position after the operating unit is in place, locks the frame and track together by means of two chamfered buttons. This arm is held in the locking position by means of a spring clip. Thus, the operating unit is rigidly fastened in the signal case, yet it may be removed in a few seconds without the necessity of removing any bolts.

Plug Connectors:

The "H-5" operating unit has a feature which is a distinct advantage with present day complex circuits, and short allowable time for changing out operating units, in that it is not necessary to remove any nuts or washers to disconnect the electrical connections to the operating unit. This is accomplished by the "plug connector" principle. Eight "plugs" are moulded in on each side of the top plate. All internal

electrical circuits are connected to these plugs. External connections are made through "jacks" mounted in plug connector housings. There are two of these housings, one right and one left, with eight "jacks" each. These "jacks" are located on the same centers as the "plugs", and are so designed that they have adequate contact area and pressure, and sufficient wipe to insure a clean contact at all times. The housings are designed so that it is mechanically impossible to insert them improperly or to interchange them right and left hand. The plug connectors are held down in place by means of a stiff strap, which is centered over the two housings.

OPTICAL ARRANGEMENT (See Fig. 1)

The optical arrangement of the "H-5" Searchlight Signal is basically the same as the Style "H-2". That is, an elliptical reflector collects the rays from a lamp, the filament of which is located at the focal point of the reflector, and concentrates these rays at the other focal point of the complete ellipse. These rays are projected beyond this point of concentration to the back lens of a ground doublet combination. This back lens is located at a distance from the concentration point equal to the focal length of the doublet combination. The cone of light as produced by the reflector is converted by the doublet lenses into a parallel beam of light. Small colored glass roundels are introduced into the light beam near the point of concentration and are moved into position by the operating unit to produce the different colors of the signal indication.

The optics of the "H-5" Searchlight Signal are, however, considerably improved over previous types. The back lens of the doublet combination, together with the reflector housing, Fig. 8, have been removed from the operating unit and mounted in the signal case. This produces a signal with increased optical efficiency, as the entire optical assembly is set up as a fixed unit in the factory, and remains as adjusted

for the particular signal regardless of interchange of operating units.

The reflector assembly is focused and the lamp socket set and sealed before it is installed in the case. In this manner, the lamp is adjusted to produce the maximum candlepower from the reflector independent of the signal lenses. The three reflector supports in the signal case are located at the Factory by optical means, and locked so that the pre-focused reflector produces the maximum in range, indication, and efficiency. Reflector assemblies are interchangeable without affecting the indication.

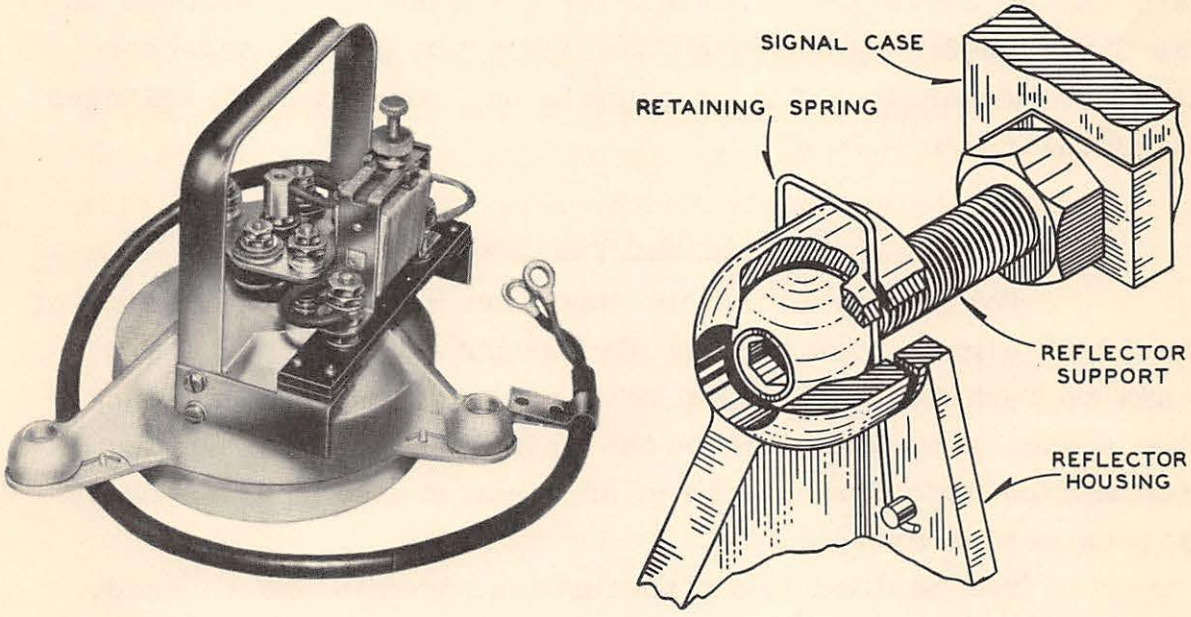


Fig. 8 - Reflector Assembly complete with lamp receptacle, flexible wire connections, handle and adjustable resistor (supplied when requested) for lamp voltage regulation. Sectioned view of one mounting lug shows how the unit is snapped on an adjustable ball stud.

The ends of the three mounting studs for the reflector housing are spherical, while in the arms of the reflector housings are sockets carefully machined to fit the spherical ends of the studs. Retaining springs are assembled in the sockets in such a manner that when the socket is pushed over the sphere, the base of the socket is forced firmly and securely against the end of the stud. Thus, a reflector holder is produced which can be quickly "snapped" in and out without

disturbing the light beam adjustment, yet it facilitates the work of cleaning the reflector and replacing the lamp.

A handle has been applied to the reflector housing to facilitate removal from the case, and to protect the lamp socket adjustment from damage in handling. When changing out operating units or cleaning the inner lens, this handle can be used to hang the reflector assembly on a hook mounted on the door. Where desired, a resistor can be furnished which is mounted on the reflector housing. This permits one to adjust the lamp voltage at the lamp terminals.

The spreadlight and deflecting prism cover glasses used in the Style "H-5" Signal are the same as those used in the Style "H-2." A thorough discussion of these, together with the proper location of signals and correct lamp voltages, is contained in U.D. #200.

SIGNAL CASE (See Fig. 5)

Particular attention has been given in the design of the "H-5" signal case to provide adequate wiring space and means to facilitate cleaning of lenses. Considerable slack wire space is provided under the operating unit so that provision may be made for extension of wires should they break or eyelets become damaged.

Two moulded bakelite terminal boards are mounted, one on each side of the case, complete with their respective plug connector housings coupled by flexible wires neatly cabled. A white celluloid marker strip is mounted under each board to identify each terminal post connection. External wires come from the lower wire, well up along the outer wall of the case and connect to their respective terminals. These wires are held in place along the wall of the case by a strap iron bracket extending from the front of the case back to where it just clears the rear of the terminal board. This bracket is cushioned with a piece of loom to protect the wires from damage. A guide is cast into the side of the case near the top to aid

in keeping the wires on the upper terminals in place. All connecting of external wires may be done with the operating unit removed, thus greatly facilitating this work.

The door on the back of the case is hinged on the side and opens away from the pole in most installations. This arrangement makes it much easier to install and remove the operating unit, and to do other work inside the case. The door is fastened with a screw hasp and staple which is positive in action and simple to open. The adapter for the outer lens has a large hand-hole which is sufficient to allow the whole hand to enter and make it easy to adjust the close-up prism and to clean the inner surfaces of the two lenses.

LAMPS

Any of the lamps used heretofore (See Instruction Pamphlet U-5037) in Union Searchlight Signals are satisfactory for use in the Style "H-5" Searchlight Signal. It is important to keep in mind the fact that the full benefits of the precision manufacturing of the optical assembly are retained best by using the highest practical degree of precision in lamps. Lamps furnished by us for this purpose are based to 1/64" precision for light center length and axial alignment.

OPERATING CHARACTERISTICS

The Style H-5 operating unit is very economical in power consumption, and in comparison with previous designs, operates twice the number of contacts, with increased front contact pressures, without any increase in the operating values which are shown in the following table.

			Armature Volts	
Contacts (All Independent)		Armature Resistance	Minimum Release	Max. Pick-Up & Working
Front	Back	Ohms		
2Y - 2G	2 + 2	250	2.0	5.5
2Y - 2G	2 + 2	500	3.0	8.0

WIRING

The plug connector leads and other internal wiring is done at the Factory and is in color code. Fig. 9 shows the internal wiring and its code from the external terminals through to the operating unit. A copy of this wiring diagram is attached to the inside of each case door. The design of

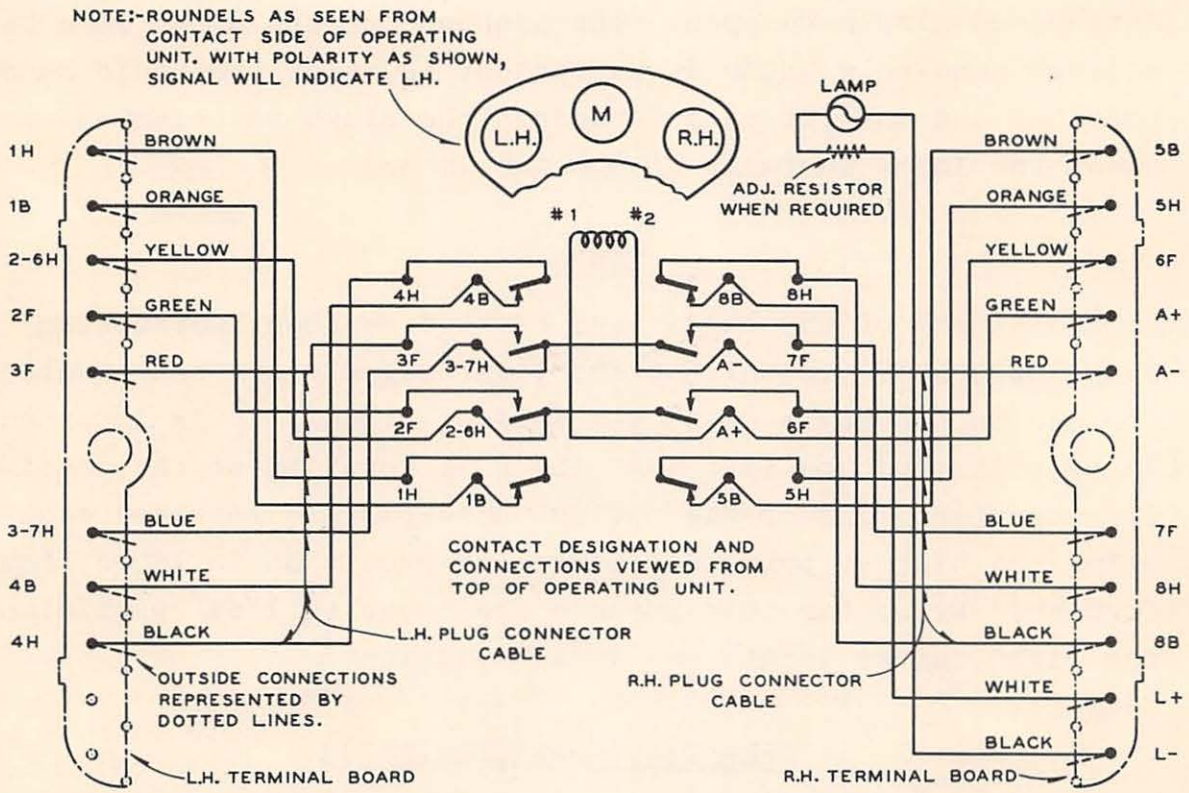


Fig. 9 - Circuits for internal wiring of Style H-5 Signal

this signal is such that all the external wiring can be completed, the signal aligned, the close-up prism adjusted, and everything ready to be placed in service before the operating unit needs to be installed. This will speed installation considerably, and will reduce the danger of damage to the operating unit during installation.

Summary of Features:

The foregoing detailed description of the Union Style "H-5" Searchlight Signal may be summarized in sixteen brief statements which call particular attention to its outstanding advantages over other searchlight signals:

1. Improved magnetic structure which results in an operating unit with smoother operating spectacle and improved efficiency.
2. Twice the number of contacts with double the front contact pressure per contact, yet with the same operating characteristics.
3. Operating unit securely fastened into case without the use of bolts, and can be removed in extremely short time.
4. Operating unit connected to external wires by means of plug connectors which are so designed that it is impossible to make mistakes in wire connections when installing or replacing units.
5. Operating units absolutely interchangeable.
6. All optical parts with the exception of colored roundels separated from operating unit and permanently located in signal case, which provides for better beam alignment.
7. Reflector mounting adjusted and fixed at factory to assure that the maximum efficiency may be obtained from the lens combination.
8. Pre-focused and sealed reflector assembly which assures the maximum candlepower obtainable from a reflector, and also provides complete interchangeability of all reflector assemblies.
9. Snap-on mounting of reflector assembly which facilitates lamp and reflector maintenance and materially reduces the time necessary to replace an operating unit.
10. Resistor can be provided on reflector assembly for convenience in adjusting lamp voltages.
11. Following procedure can be carried out in 30 seconds:

    Remove reflector assembly, hang it on door hook, unlock and remove plug connectors, unlock and remove operating unit, install new unit and lock in place, replace plug connectors, and replace reflector assembly.

12. Generous space for slack wire in bottom of signal case.

13. Simplified tags on terminal board to identify outside terminal with connection on or through operating unit.

14. Housing for optical parts provides for convenient access for cleaning lenses and adjusting close-up prism.

15. All parts of signal more readily accessible to maintainer or wireman.

16. Meets A.A.R. Signal Section Spec. 157-34 for searchlight type color light signal operating unit with generous margins.

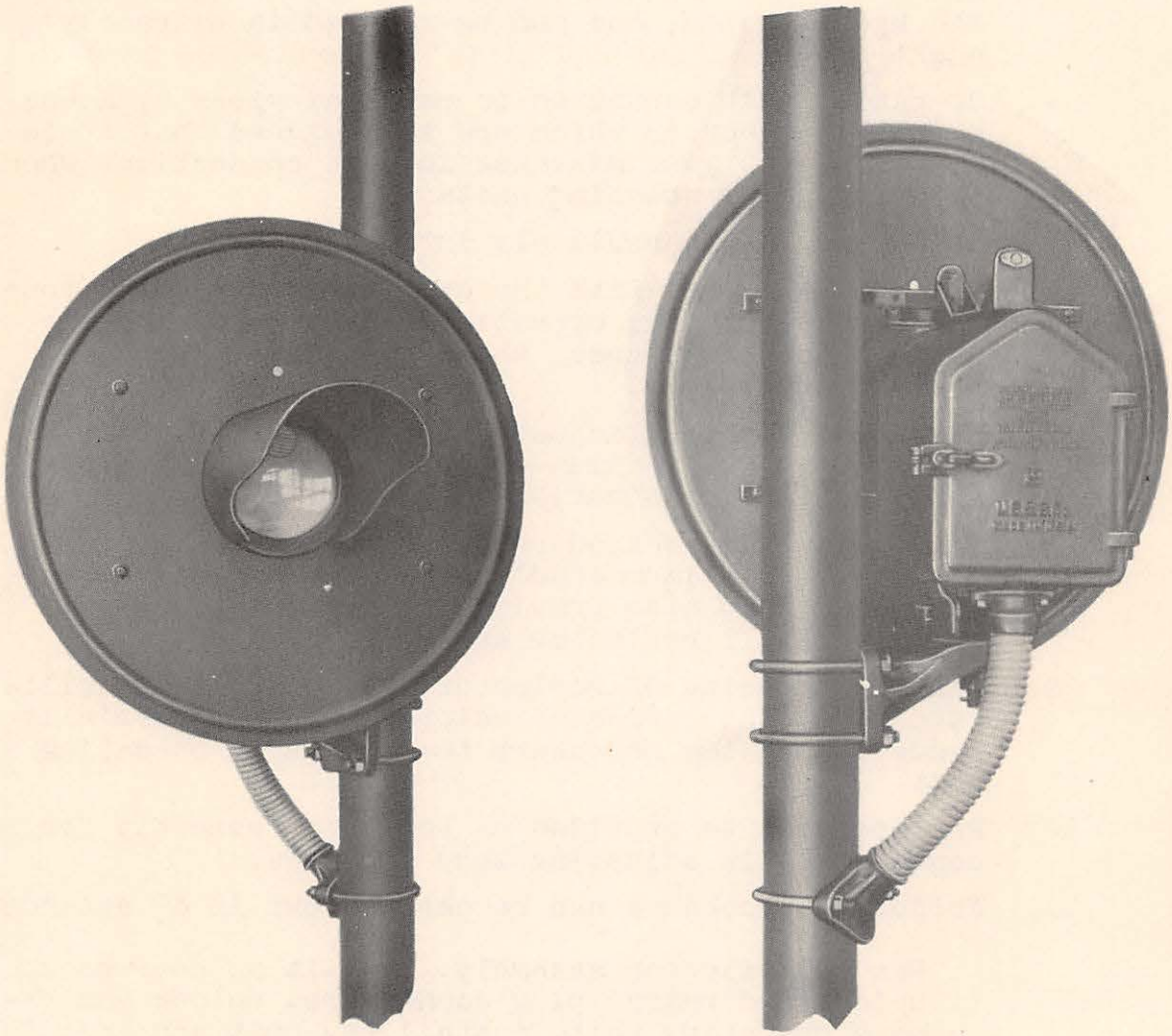


Fig. 10 - Front and rear view of Style H-5 Searchlight Signal

ORDERING INSTRUCTIONS

Until such time as permanent catalog references may be provided, complete assemblies of Style "H-5" Searchlight Signals may be ordered by referring to catalog plates B-2865 to B-2872, stating that H-5 units, described in U. D. #237 should be supplied instead of H or H-2 units. It is suggested that orders include the following information:

1. Kind of Signal: High, Bridge or Dwarf.
2. Color and arrangement of roundels, corresponding with LH, M and RH, as shown on wiring diagram, Fig. 9.
3. Voltage of lamp and of battery or other power available.
4. With or without:
   (a) Marker light
   (b) Background
   (c) Deflecting or spreadlight cover glass for curves.

H. H. Caswell 1/25/38

Vice Pres. & Gen.Mgr.